DPMJET3

Wan Chang

2020.08.13

Model description

DPMJET3 is based on the Dual Parton Model and unifies all features of the DTUNUC-2, DPMJET-II and PHOJET1.12.

	BeAGLE	DPMJET3
Primary interaction	PYTHIA	PHOJET
Intra-nuclear cascade	DPMJET	HADRIN
Nuclear remnant evaporation	FLUKA	FLUKA

- The Dual Parton Model (DPM) is such a model and its fundamental ideas are presently the basis of many of the Monte Carlo (MC) implementations of soft interactions in codes used for Radiation Physics simulations.
- Phojet, being used for the simulation of elementary hadron-hadron, photon-hadron and photon-photon interactions with energies greater than 5 GeV, implements the DPM as a two-component model using Reggeon theory for soft and perturbative QCD for hard interactions.
- The strength of DTUNUC-2 is in the description of photoproduction and nuclear collisions up to TeV-energies. On the other hand, DPMJET-II is widely used to simulate cosmic-ray interactions up to the highest observed energies.

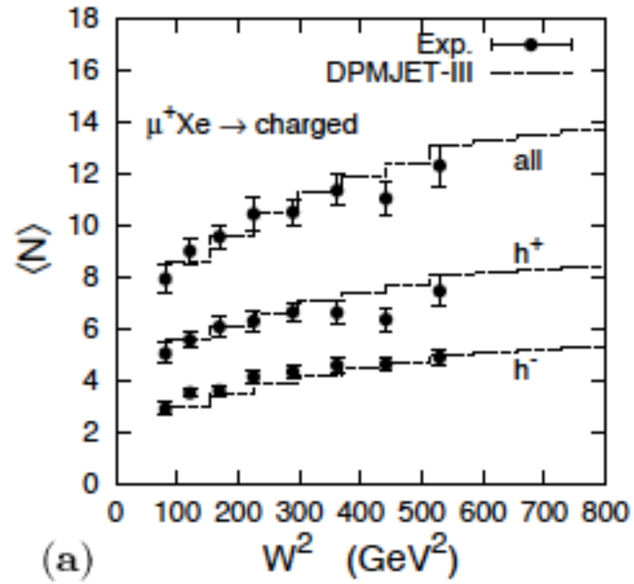
Intranuclear cascade

- Particles created in string fragmentation processes are followed on straight trajectories in space and time. A certain formation time is required before newly created particles can re-interact in the spectator nuclei. These re-interactions are of low energy and are described by HADRIN based on parameterized exclusive interaction channels.
- Excitation energies of prefragments are calculated by summing up the recoil momenta transfered to the respective prefragment by the hadrons leaving the nuclear potential.
- The prefragments are assumed to be in an equilibrium state and excitation energy is dissipated by the evaporation of nucleons and light nuclei and by the emission of photons.

DPMJET3 compared to data

https://wiki.bnl.gov/eic/upload/Dpmjet3_intro.pdf

multiplicities of charged hadrons from muXe interactions at 490 GeV compared to data:



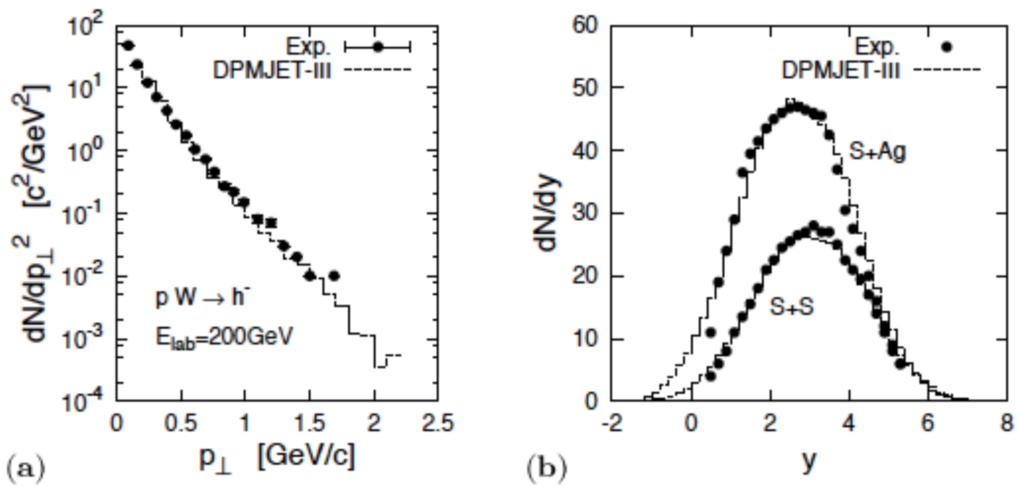
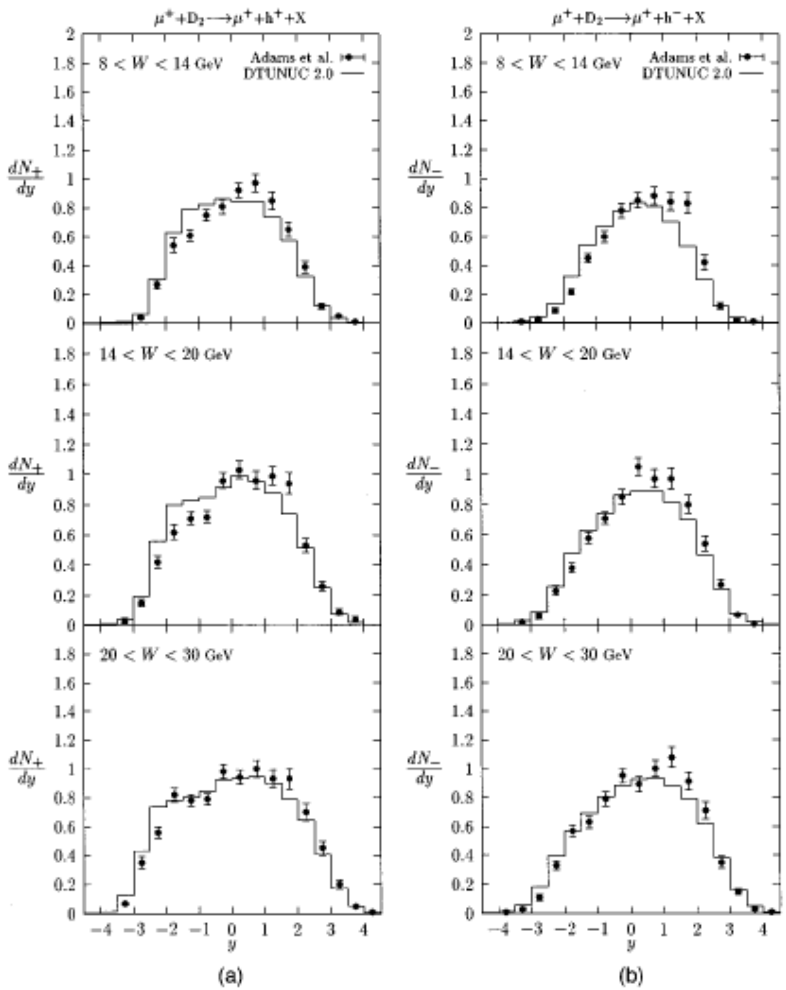


Fig. 1. Negatively charged hadron production in nuclear collisions at 200 GeV/nucleon

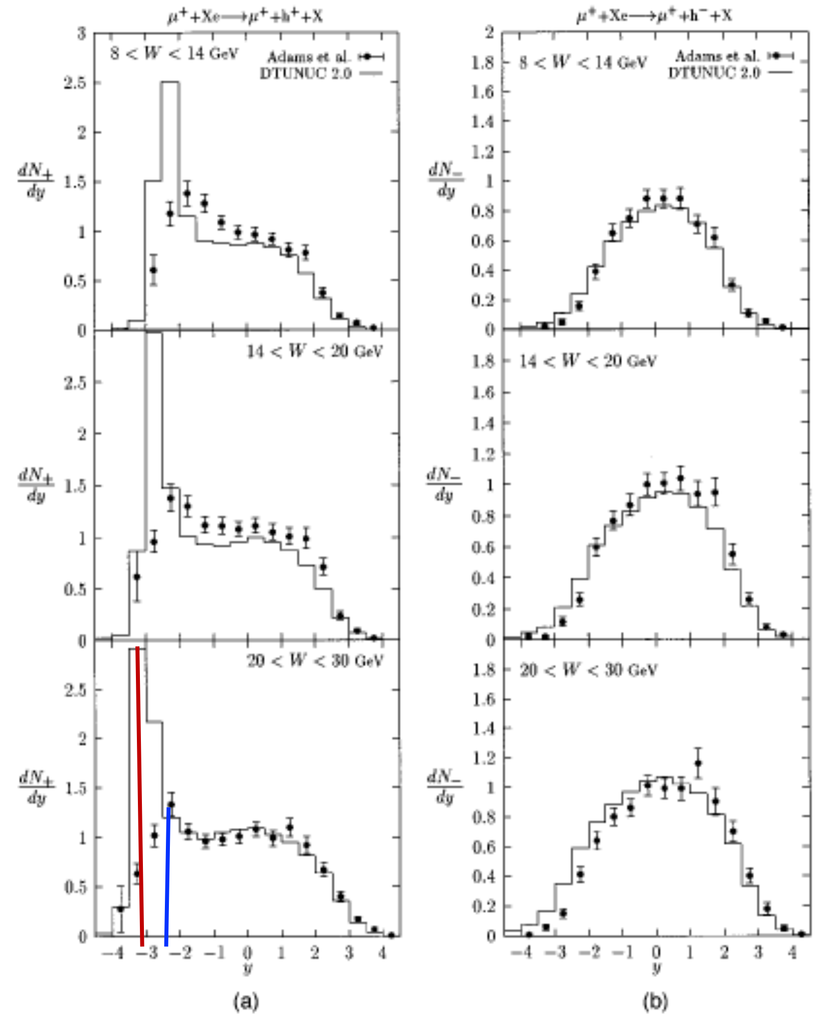
Phys.Rev.D 57 (1998) 2889-2902

DTUNUC-2.0 compared to data

$\mu^+ + D$



$\mu^+ + Xe$

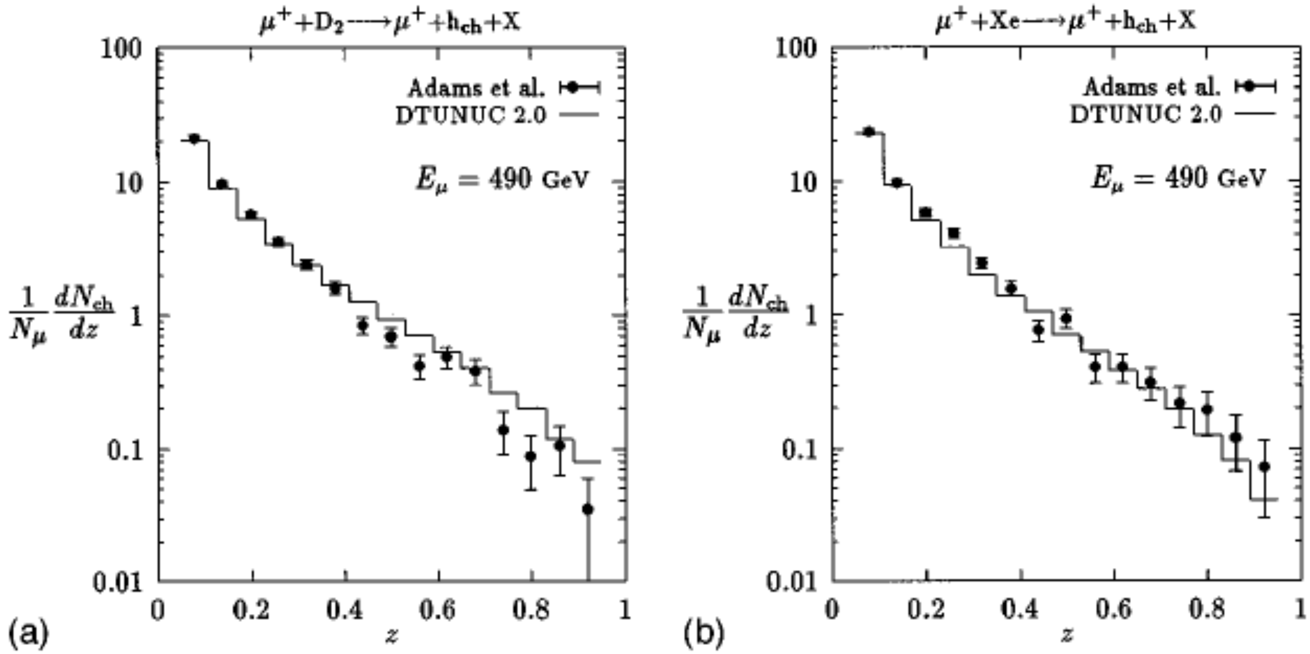


They assume that the differences might be due to additional kinematic cuts applied to the data or due to experimental uncertainties.

Phys.Rev.D 57 (1998) 2889-2902

DTUNUC-2.0 compared to data

Energy (z) distributions of charged hadrons from muon-deuterium (a) and muon-xenon interactions (b) at 490 GeV are compared to measurements of the E665 Collaboration:



Both, model results and data, are restricted to the shadowing region, i.e. to $x_{Bj} < 0.005$ and $Q^2 < 1\text{GeV}^2$.